PROTOCOL EXTENSION TO SIMNET 6.6.1

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MULTIRAD NETWORK

PROTOCOL EXTENSION TO SIMNET 6.6.1

REVISION HISTORY

REVISION	DATE	COMMENT
Rev. N/C	2 April 1992	Update
Rev. A	14 April 1992	Update

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1.0 Introduction

This paper identifies the protocol extensions to SIMNET 6.6.1 developed by Loral Defense Systems-Akron for Armstrong Labs at Williams AFB. The protocol extensions were designed to support the unique requirements of air to air combat involving heterogeneous simulators .

Five protocol data units (PDU's) were modified by the addition of new data fields:
- Activate Request,
- Deactivate Request
- Vehicle Appearance,
- Fire and
- Impact.

These PDU's and their new fields are described in the body of the text.

Three completely new PDU's were added. They are:
- Radar,
- Emitter and
- Freeze.

The Radar PDU describes describes a radar and lists the vehicles being illuminated. The Emitter PDU describes all emitters that are not radars. The Freeze (Unfreeze) PDU's, control vehicle activation individually or globally. This allows an entire scenario to be controlled/synchronized from a single location.

2.0 Protocol Data Units

2.1 Activate Request PDU

One network device may prompt another to begin simulating a vehicle through an activate request.. The following fields have been added to SIMNET 6.6.1 to provide initial start-up conditions for a vehicle.

- Speed,
- Freeze (Frozen or Unfrozen)
- Fuel quantity
- Radio Channel and
- Mission Number.

The Activate Request PDU includes the following data:

FIELD SIZE (bits)	ACTIVATE REQUEST PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
8	ACTIVATE REASON	8-bit unsigned integer
8	VEHICLE CLASS	8-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
160	ORGANIZATIONAL UNIT	Force ID - 8-bit unsigned integer
		Organization Type - 8-bit unsigned integer
		Unit Identifier - 18 - 8-bit unsigned integers
96	MARKING	Character Set - 8-bit integer
		Text - 11 - 8-bit characters
64	VEHICLE GUISES	Distinguished - 32-bit unsigned integer
		Other - 32-bit unsigned integer
32	SIMULATED TIME	32-bit unsigned integer

B

FIELD SIZE (bits)	ACTIVATE REQUEST PDU CONTINUED			
128	TERRAIN DATABASE ID	Terrain Name - 14 - 8-bit characters		
		Terrain Version - 16-bit unsigned integer		
8	BATTLE SCHEME	8-bit unsigned integer		
1	ON SURFACE	1-bit unsigned integer		
23	PADDING	23-bit integer		
960	VEHICLE STATUS	Vehicle Type - 32-bit unsigned integer		
		Odometer - 32-bit floating point		
		Age - 8-bit unsigned integer		
		Unused - 24-bits		
		Failures (Vehicle Subsystems) - 416-bits		
		Status Category - 16-bit unsigned integer		
		Padding - 16-bit integer		
		Engine Power - 8-bit unsigned integer	Generic Status Category (A/C)	B
		Battery Voltage - 24-bit unsigned integer		
		Munition Record [6]	Type - 32-bit unsigned integer	
			Quantity - 32-bit floating point	
192	LOCATION (WORLD COORDINATES)	x - 64-bit floating point		
		y - 64-bit floating point		
		z - 64-bit floating point		
64	SIMPLE VEHICLE DATA (A/C)	Yaw - 32-bit BAM		
		Padding - 32-bit integer		
96	VELOCITY	x - 32-bit floating point		
		y - 32-bit floating point		
		z - 32-bit floating point		
1	FREEZE STATE	1-bit unsigned integer		B
31	PADDING	31-bit unsigned integer		
32	VLVIS	32-bit floating point		

FIELD SIZE (bits)	ACTIVATE REQUEST PDU CONTINUED	
8	SKY COLOR	8 - bit unsigned integer
24	PADDING	24 - bit integer
32	FUEL QUANTITY	32-bit floating point
16	RADIO CHANNEL	16-bit unsigned integer
16	MISSION #	16-bit unsigned integer
1536	WAYPOINTS [16]	Lat - 32-bit floating point
		Lon - 32-bit floating point
		Alt - 32-bit floating point

B

Total Activate Request PDU Size = 3648 bits B

Simulation PDU header information

PROTOCOL VERSION — SIMNET protocol version used in the variant portion of the PDU

PDU TYPE — PDU type to follow in the variant portion of the packet

EXERCISE ID — Exercise generating PDU (important when multiple exercises on network)

Activate Request Variant

ACTIVATE REASON — Reason to activate the vehicle

- 0 Activate reason other
- 1 Exercise start
- 2 Exercise restart
- 3 Vehicle reconstitution
- 4 Towing arrival

VEHICLE CLASS — Class for number of independently moveable parts for RVA

- 0 Vehicle class irrelevant
- 1 Vehicle class static
- 2 Vehicle class simple
- 3 Vehicle class tank

VEHICLE ID — Vehicle identification

- Simulation address
  - Site
  - Host
- Vehicle

ORGANIZATIONAL UNIT — Organizational hierarchy (not currently used)

MARKING — Character string of vehicle markings

VEHICLE GUISES		
	Distinguished	As seen by blue team
	Other	As seen by other teams
	Bit field	
	Domain	3
	Environment	3
	Class	3
	Class	3
	Country	6
	Series	6
	Model	6
	Function	5
SIMULATED TIME		Time being simulated
TERRAIN DATABASE ID		Database being used
BATTLE SCHEME		Identifies how force ID's and guises are being used
	0 Battle scheme other	
	1 Battle scheme absolute (does not use guises)	
	2 Battle scheme relative (uses guises)	
ON SURFACE		Indicates if vehicle is on the surface of the database or in flight
VEHICLE STATUS		Contains status of vehicle. The only field currently used is munitions.
LOCATION		Location in world coordinates (meters)
VEHICLE DATA - YAW		Initial rotation of vehicle (BAM)
VELOCITY		Initial velocity (meters per second) | B
FREEZE STATE		Initial freeze mode
	0 Unfreeze	
	1 Freeze	
VLSVIS		Visibility in visible light (meters) | B
SKY COLOR		Simulated sky color | B
FUEL QUANTITY		Initial fuel (pounds)
RADIO CHANNEL		Radio channel
MISSION NUMBER		Number of mission for initialization
WAYPOINTS		Lat, lon and alt of 16 waypoints

2.2 Activate Response PDU

A network device that correctly receives an Activate Request must immediately respond by returning an Activate Response. No changes were made to this PDU from the SIMNET 6.6.1 baseline. The Activate Response includes the following data:

FIELD SIZE (bits)	ACTIVATE RESPONSE PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
8	RESULT	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
16	TIME LIMIT	16-bit unsigned integer
16	PADDING	16-bit integer
32	PADDING	32-bit integer

B

Total Activate Response PDU Size = 192 bits

B

Simulation PDU header information

PROTOCOL VERSION — SIMNET protocol version used in the variant portion of the PDU

PDU TYPE — PDU type to follow in the variant portion of the packet

EXERCISE ID — Exercise generating PDU (important when multiple exercises on network)

Activate response variant

VEHICLE ID — Vehicle identification

Simulation address — Site

Host

Vehicle

REASON
- 0 Activate request accepted
- 1 Invalid activation parameter
- 2 Unexpected activate reason
- 3 Invalid vehicle identifier
- 4 Terrain database unavailable

TIME LIMIT Not currently used

2.3 Deactivate Request PDU

A network device may withdraw its own vehicles from an exercise at any time, or it may be requested by another simulator to withdraw. In either case, the withdrawal of the vehicle is announced using a Deactivation. The time stamp field was added to this PDU.

FIELD SIZE (bits)	DEACTIVATE REQUEST PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
8	REASON	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
32	TIME STAMP	32-bit unsigned integer

B

Total Deactivate Request PDU Size = 160 bits

B

Simulation PDU header information
- PROTOCOL VERSION — SIMNET protocol version used in the variant portion of the PDU
- PDU TYPE — PDU type to follow in the variant portion of the packet
- EXERCISE ID — Exercise generating PDU (important when multiple exercises on network)

Deactivate request variant

VEHICLE ID — Vehicle identification
- Simulation address — Site
- Host
- Vehicle

REASON — Reason for deactivation
- 0 Deactivate reason other
- 1 Exercise end
- 2 Vehicle withdrawn
- 3 Vehicle destroyed
- 4 Towing departure

TIME STAMP — Time of PDU issuance

2.4 Vehicle Appearance PDU

A simulator/network device periodically reports information about a vehicle it simulates so that other devices on the network may depict that vehicle. A network device will issue a new Vehicle Appearance for a vehicle whenever the discrepancy between the vehicle's actual appearance and its dead reckoned appearance exceeds one of the defined thresholds. It will also issue a new Vehicle Appearance if 5 seconds have elapsed since its last transmittal. This PDU has been modified to include a linear acceleration vector, an angular acceleration vector, throttle position and fuel quantity. A Vehicle Appearance PDU includes the following data:

FIELD SIZE (bits)	VEHICLE APPEARANCE PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
8	VEHICLE CLASS	8-bit unsigned integer
8	FORCE ID	8-bit unsigned integer
64	VEHICLE GUISES	Distinguished - 32-bit unsigned integer
		Other - 32-bit unsigned integer

B

FIELD SIZE (bits)	VEHICLE APPEARANCE PDU CONTINUED		
192	LOCATION (WORLD COORDINATES)	x - 64-bit floating point	
		y - 64-bit floating point	
		z - 64-bit floating point	
288	ROTATION MATRIX	9 - 32-bit floating points	
32	APPEARANCE	32-bit unsigned integer	
96	MARKING	Character Set - 8-bit integer	
		Text - 11 - 8-bit characters	
32	TIME STAMP	32-bit unsigned integer	
32	CAPABILITIES	32-bit unsigned integer	
16	ENGINE SPEED	16-bit unsigned integer	
1	STATIONARY	1-bit unsigned integer	
7	PADDING	7-bit integer	B
8	REASON	8-bit unsigned integer	
96	LINEAR VELOCITY VECTOR	x - 32-bit floating point	Vehicle Class Simple
		y - 32-bit floating point	
		z - 32-bit floating point	
32	PADDING	32-bit unsigned integer	
96	LINEAR ACCEL. VECTOR	x - 32-bit floating point	
		y - 32-bit floating point	
		z - 32-bit floating point	
96	ANGULAR VELOCITY VECTOR	pitch rate - 32-bit floating point	
		roll rate - 32-bit floating point	
		yaw rate - 32-bit floating point	
32	THROTTLE POSITION	32-bit floating point	
32	FUEL QUANTITY	32-bit floating point	B

Total Vehicle Appearance PDU Size = 1280 bits

Simulation PDU header information

PROTOCOL VERSION	SIMNET protocol version used in the variant portion of the PDU
PDU TYPE	PDU type to follow in the variant portion of the packet
EXERCISE ID	Exercise generating PDU (important when multiple exercises on network)

Vehicle Appearance variant

VEHICLE ID — Vehicle identification
- Simulation address
  - Site
  - Host
- Vehicle

VEHICLE CLASS — Class for number of independently moveable parts for RVA
- 0 Vehicle class irrelevant
- 1 Vehicle class static
- 2 Vehicle class simple
- 3 Vehicle class tank

FORCE ID — Force identifier
- 0 Force ID irrelevant
- 1 Distinguished force ID
- 2 Other force ID
- 3 Observer force ID
- 4 Target force ID

VEHICLE GUISES
- Distinguished — As seen by blue team
- Other — As seen by other teams
- Bit field
  - Domain 3
  - Environment 3
  - Class 3
  - Country 6
  - Series 6
  - Model 6
  - Function 5

LOCATION — Location in world coordinates (meters)

ROTATION MATRIX — 3x3 rotation matrix for vehicle orientation

APPEARANCE — Bit field

BIT	PURPOSE
0	Vehicle destroyed (1=true)
1	Vehicle smoke plume (1=true)
2	Vehicle flaming (1=true)
3-4	Vehicle dust cloud 0 No dust cloud 1 Small dust cloud 2 Medium dust cloud 3 Large dust cloud

B

5	Vehicle mobility disabled (1=true)	
6	Vehicle fire power disabled	B
7	Vehicle communications disabled	
8	Vehicle shaded (1=vehicle in shadow)	
30	Vehicle TOW launcher up	
31	Vehicle engine smoke	

MARKING	Character string of vehicle markings	
TIMESTAMP	Time PDU was issued	
CAPABILITIES	Capabilities of the vehicle (bit field)	B
ENGINE SPEED	Engine speed (Revolutions per second)	
STATIONARY	Flag variable	
REASON	Reason for issuing PDU	B
LINEAR VELOCITY VECTOR	Velocity vector in world coordinates (m/s)	
LINEAR ACCELERATION	Acceleration vector (m/s2)	
ANGULAR VELOCITY	Angular velocity vector (rad/s)	
THROTTLE POSITION	Engine throttle position	
FUEL QUANTITY	Pounds of fuel remaining	

2.5 Fire PDU

A Fire describes the firing of a shell, a burst of machine gun fire, or a missile. It is issued by the firing vehicle simulator. A time stamp has been added to this PDU.

FIELD SIZE (bits)	FIRE PDU FIELDS		
8	PROTOCOL VERSION	8-bit unsigned integer	
8	PDU TYPE	8-bit unsigned integer	
8	EXERCISE ID	8-bit unsigned integer	
40	PADDING	40-bit unsigned integer	B
48	ATTACKER ID	Site - 16-bit unsigned integer	
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
16	EVENT ID	16-bit unsigned integer	

FIELD SIZE (bits)	FIRE PDU CONTINUED		
96	BURST DESCRIPTOR	Projectile - 32-bit unsigned integer	
		Detonator - 32-bit unsigned integer	
		Quantity - 16-bit unsigned integer	
		Rate - 16-bit unsigned integer	
64	TARGET DESCRIPTOR	Target Type - 8-bit integer	
		Unused - 8-bit integer	
		Site - 16-bit unsigned integer	
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
96	VELOCITY VECTOR	x - 32-bit floating point	
		y - 32-bit floating point	
		z - 32-bit floating point	
192	LOCATION (WORLD COORDINATES)	x - 64-bit floating point	
		y - 64-bit floating point	
		z - 64-bit floating point	
48	PROJECTILE ID	Site - 16-bit unsigned integer	
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
8	PADDING	8-bit unsigned integer	
8	FIRE TYPE	8-bit unsigned integer	
128	SHELL FIRE DESCRIPTOR	Range - 32-bit floating point	FIRE TYPE = shell
		Slew Rate - 32-bit floating point	
		Ammo Type - 32-bit unsigned integer	
		Padding - 32-bit integer	
	MISSILE FIRE DESCRIPTOR	Tube - 8-bit unsigned integer	FIRE TYPE = missile
		Padding - 8-bit unsigned integer	
		Padding - 16-bit integer	
		Padding - 32-bit integer	
		Padding - 32-bit integer	
		Padding - 32-bit integer	

FIELD SIZE (bits)	FIRE PDU CONTINUED	
32	TIME STAMP	32-bit unsigned integer

Total Fire PDU Size = 800 bits B

Simulation PDU header information
- PROTOCOL VERSION — SIMNET protocol version used in the variant portion of the PDU
- PDU TYPE — PDU type to follow in the variant portion of the packet
- EXERCISE ID — Exercise generating PDU (important when multiple exercises on network)

Fire variant
- ATTACKER ID — Vehicle identification
  - Simulation address
    - Site
    - Host
  - Vehicle
- EVENT ID — For correlation with impact PDU
- BURST DESCRIPTOR
  - Projectile — Munition
  - Detonator — Detonator
  - Quantity — # of projectiles
  - Rate — Burst rate
- TARGET DESCRIPTOR
  - Target type
    - 0 Target unknown
    - 1 Target not a vehicle
    - 2 Target is a vehicle
  - Vehicle ID
- VELOCITY VECTOR — Velocity of the projectile
- LOCATION — World coordinates of origination of projectile
- PROJECTILE ID — Vehicle ID of projectile
  - Simulation address
    - Site
    - Host
  - Vehicle
- FIRE TYPE — Type of projectile
  - 1 Fire type shell
  - 2 Fire type missile
- If FIRE TYPE = shell
  - RANGE — Range of munition
  - SLEW RATE — rate
  - AMMO TYPE — Type of ammunition

If FIRE TYPE = missile
TUBE — Tube from which missile was launched
TIME STAMP — Time when PDU was issued

2.6 Impact PDU

An Impact is issued by a simulator when the flight of a projectile it is simulating ends. It may or may not describe an impact between the projectile and a particular target vehicle. A time stamp and probability of kill field have been added. Probability of kill is expressed as a number between zero and one.

FIELD SIZE (bits)	IMPACT PDU FIELDS		
8	PROTOCOL VERSION	8-bit unsigned integer	
8	PDU TYPE	8-bit unsigned integer	
8	EXERCISE ID	8-bit unsigned integer	
40	PADDING	40-bit unsigned integer	B
48	ATTACKER ID	Site - 16-bit unsigned integer	
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
16	EVENT ID	16-bit unsigned integer	
96	BURST DESCRIPTOR	Projectile - 32-bit unsigned integer	
		Detonator - 32-bit unsigned integer	
		Quantity - 16-bit unsigned integer	
		Rate - 16-bit unsigned integer	
48	PROJECTILE ID	Site - 16-bit unsigned integer	
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
8	FIRE RESULT	8-bit unsigned integer	B
8	PADDING	8-bit unsigned integer	
32	MOMENTUM	32-bit floating point	
32	ENERGY	32-bit floating point	

FIELD SIZE (bits)	IMPACT PDU CONTINUED	
32	DIRECTIONALITY	32-bit floating point
192	LOCATION (WORLD COORDINATES)	x - 64-bit floating point
		y - 64-bit floating point
		z - 64-bit floating point
64	RANGE	64-bit floating point
48	TARGET ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
16	VEHICLE COMPONENT	16-bit unsigned integer
96	IMPACT LOCATION (VEHICLE COORDINATES)	x - 32-bit floating point
		y - 32-bit floating point
		z - 32-bit floating point
96	TRAJECTORY (VEHICLE COORDINATES)	x - 32-bit floating point
		y - 32-bit floating point
		z - 32-bit floating point
32	TIME STAMP	32-bit unsigned integer
16	PK	16-bit integer

Total Impact PDU Size = 928 bits

B

Simulation PDU header information

PROTOCOL VERSION	SIMNET protocol version used in the variant portion of the PDU
PDU TYPE	PDU type to follow in the variant portion of the packet
EXERCISE ID	Exercise generating PDU (important when multiple exercises on network)

Impact variant

ATTACKER ID	Vehicle identification
Simulation address	Site
	Host
Vehicle	
EVENT ID	For correlation with fire PDU
BURST DESCRIPTOR	

	Projectile	Munition
	Detonator	Detonator
	Quantity	# of projectiles
	Rate	Burst rate
PROJECTILE ID		Vehicle ID of projectile
	Simulation address	Site
		Host
	Vehicle	
FIRE RESULT		
	14	Hit / Terminate / Kill
	15	No target miss
	16	Velocity gate miss
	17	Gimbal limit miss
	18	Ground impact miss
	19	Low closure rate miss
	20	Low velocity miss
	21	Max time of flight miss
	22	Safe-arm miss
	23	Low probability of kill miss
	24	Excessive miss distance
	25	Target already killed
	26	Line of sight miss (AIM-9)
	27	Jettisoned
	28	Terminated but not yet scored
MOMENTUM		Momentum of projectile
ENERGY		Energy of projectile at impact
DIRECTIONALITY		Directionality of projectiles explosion in steradians
LOCATION		Location of impact in world coordinates (meters)
RANGE		Range of projectile
TARGET ID		Vehicle ID of target
	Simulation address	Site
		Host
	Vehicle	
VEHICLE COMPONENT		Component struck by projectile
	0	Vehicle component irrelevant
	1	Hull component
	2	Turret component
IMPACT LOCATION		Location of impact in vehicle coordinates
TRAJECTORY		Vehicle coordinates
TIME STAMP		Time when PDU was issued
PK		Probability of kill

2.7 Radar PDU

A Radar periodically issued by the simulator of a vehicle possessing a radar. This entire PDU is new and was added to meet Armstrong Labs unique requirements. The PDU's describe the location, and characteristics of the signals with the following data:

FIELD SIZE (bits)	RADAR PDU FIELDS	
8	PROTOCOL VERSION	8-bit unsigned integer
8	PDU TYPE	8-bit unsigned integer
8	EXERCISE ID	8-bit unsigned integer
40	PADDING	40-bit unsigned integer
48	VEHICLE ID	Site - 16-bit unsigned integer
		Host - 16-bit unsigned integer
		Vehicle - 16-bit unsigned integer
32	TIME STAMP	32-bit unsigned integer
8	# ILLUMED	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
32	RADAR SYSTEM	32-bit integer
8	RADAR MODE	8-bit unsigned integer
8	PADDING	8-bit unsigned integer
128	SWEEP	Azimuth Center - 32-bit floating point
		Azimuth Width - 32-bit floating point
		Elevation Center - 32-bit floating point
		Elevation Width - 32-bit floating point
32	POWER	32-bit integer

B

FIELD SIZE (bits)	RADAR PDU CONTINUED		
80 n	VEHICLE ID	Site - 16-bit unsigned integer	For Each Illumined Entity
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
	RADAR DATA	32-bit integer	

Total Radar PDU Size = 368 + 80n bits

B

Simulation PDU header information

PROTOCOL VERSION	SIMNET protocol version used in the variant portion of the PDU
PDU TYPE	PDU type to follow in the variant portion of the packet
EXERCISE ID	Exercise generating PDU (important when multiple exercises on network)

Radar variant

VEHICLE ID — Vehicle identification
- Simulation address
  - Site
  - Host
  - Vehicle

TIME STAMP — Time when PDU was issued

ILLUMED — Number of vehicles illuminated by radar

RADAR SYSTEM — Bit field identifying radar system

Radar System Category (Bits 28-31)

0	Reserved (unused)
1	Air-Based Fire Control
2	Air-Based Search
3	Ground-Based Fire Control
4	Ground-Based Search
5	Sea-Based Fire Control
6	Sea-Based Search

RadarSystem Subcategory(Bits 16-23 optional)

RadarSystem ID (Bits 0-15)

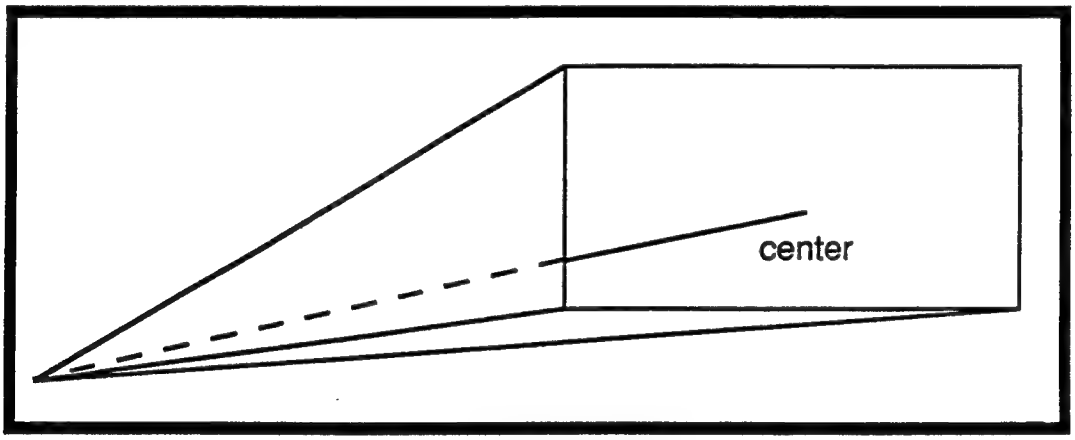
0	Reserved	14	HighLark
1	APG-66	15	AN/APS-125
2	APG-68	16	LN-66 HP
3	APG-63	17	AN/APS-166
4	APG-65	18	AN/APS-115
5	APG-70	19	AN/SPQ-9
6	JAYBIRB	20	AN/SPQ-9A
7	(Mig-31)	21	AN/SPG-60
8	(Mig-29)	22	AN/SPS-49
9	(Mig-27)	23	AN/SPS-55

10	(Su-27)	24	AN/SPS-67
11	AN/APY-2	25	AN/SPS-10
12	SUAWACS	26	SPY-1a
13	FoxFire		

RADAR MODE — Current radar mode

1	Search
2	Doppler HPRF
3	Doppler MPRF
4	Doppler LPRF
5	Monopulse
6	Acquisition
7	Tracking
8	Track while scan
9	Terrain follow
10	Data link

AZIMUTH CENTER — Azimuth center angle
AZIMUTH WIDTH — Azimuth width half angle
ELEVATION CENTER — Elevation center angle
ELEVATION WIDTH — Elevation width half angle



RADAR CONE

RADAR POWER — Average emitting power in decibel milliwatts
RADAR TARGET LIST
Vehicle ID
Radar data
bits 24 - 31 -> Radar Mode pertaining to applicable Vehicle ID
bits 0 - 23 -> Specific Radar System/Radar Mode data (optional)
Might be : Polarization, Freq Hopping, Staggered PRF, etc]

2.8 Emitter PDU

A new PDU periodically issued by a simulator for emitters other than radars. The PDU's describe the location, and characteristics of the signals with the following data:

FIELD SIZE (bits)	EMITTER PDU FIELDS		
8	PROTOCOL VERSION	8-bit unsigned integer	
8	PDU TYPE	8-bit unsigned integer	
8	EXERCISE ID	8-bit unsigned integer	
40	PADDING	40-bit unsigned integer	B
48	VEHICLE ID	Site - 16-bit unsigned integer	
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	
32	TIME STAMP	32-bit unsigned integer	
16	# EMITTERS	16-bit integer	
256 n	EMITTER CLASS	16-bit unsigned integer	For Each Emitter
	DATABASE #	16-bit unsigned integer	
	EMITTER MODE	16-bit unsigned integer	
	EMITTER POWER	16-bit unsigned integer	
	FREQUENCY	32-bit floating point	
	CHANNEL	32-bit unsigned integer	
	SWEEP	Azimuth Center - 32-bit floating point	
		Azimuth Width - 32-bit floating point	
		Elevation Center - 32-bit floating point	
		Elevation Width - 32-bit floating point	

Total Emitter PDU Size = 160 + 256n bits B

Simulation PDU header information

PROTOCOL VERSION	SIMNET protocol version used in the variant portion of the PDU
PDU TYPE	PDU type to follow in the variant portion of the packet
EXERCISE ID	Exercise generating PDU (important when multiple exercises on network)

Emitter variant

VEHICLE ID	Vehicle identification
Simulation address	Site
	Host
Vehicle	
TIME STAMP	Time when PDU was issued
# EMITTERS	Number of emitters on vehicle

For each emitter

EMITTER CLASS

0	Other	9	SHF
1	Sound	10	EHF
2	infrasonic2	11	Infrared
3	VHF	12	Visible
4	LF	13	Ultraviolet
5	MF	14	XRay
6	HF	15	GammaRay
7	VHF	16	CosmicRay
8	UHF		

DATABASE NUMBER

VHF	0x0001	ILS	0x0020	Jammer	0x1000
UHF	0x0002	AAI	0x0100		
TACAN	0x0010	IFF	0x0200		

EMITTER MODE

0	Transmit
1	Mode 1
2	Mode 2
3	Mode 3
4	Mode 4
5	Mode 4a
6	Mode 4b

EMITTER POWER	Average power of emission
FREQUENCY	Frequency of emission
CHANNEL	Emitter channel
AZIMUTH CENTER	Azimuth center angle
AZIMUTH WIDTH	Azimuth width half angle
ELEVATION CENTER	Elevation center angle
ELEVATION WIDTH	Elevation width half angle

2.9 Freeze PDU

The freeze PDU is used to both freeze and unfreeze. It can be used both globally and individually to control an entire exercise. Freeze is particularly useful for starting or restarting an exercise from a precise point in time/space.

FIELD SIZE (bits)	FREEZE PDU FIELDS		
8	PROTOCOL VERSION	8-bit unsigned integer	
8	PDU TYPE	8-bit unsigned integer	
8	EXERCISE ID	8-bit unsigned integer	
40	PADDING	40-bit unsigned integer	B
8	FREEZE MODE	8-bit unsigned integer	
8	PADDING	8-bit unsigned integer	
32	TIME STAMP	32-bit unsigned integer	
16	# VEHICLES	16-bit unsigned integer	
48 n	VEHICLE ID	Site - 16-bit unsigned integer	For each Selected Vehicle
		Host - 16-bit unsigned integer	
		Vehicle - 16-bit unsigned integer	

Total Freeze PDU Size = 128 + 48n bits B

Simulation PDU header information

PROTOCOL VERSION — SIMNET protocol version used in the variant portion of the PDU

PDU TYPE — PDU type to follow in the variant portion of the packet

EXERCISE ID — Exercise generating PDU (important when multiple exercises on network)

Freeze variant

FREEZE MODE

0 Unfreeze

1 Freeze

TIME STAMP — Time PDU was issued

# VEHICLE	Number of vehicles to change freeze state (Note: use 0 for global)
VEHICLE ID ARRAY	Optional array of vehicle ID's if selectively changing freeze state
Simulation address	Site
	Host
Vehicle	

APPENDIX A

Guise Definitions

*** AIRCRAFT ***

A-10:	0x24820802
F-14A:	0x24820821
F-14D:	0x24820841
F-15C:	0x24823042
F-15E:	0x24823021
F-16A:	0x24821021
F-16B:	0x24821041
F-16C:	0x24821061
F-16D:	0x24821081
F-20:	0x24821801
F-4S:	0x24822021
F-5F:	0x24822821
SU-25:	0x24840802
SU-27:	0x24842002
Mig-21:	0x24841021
Mig-23:	0x24841001
Mig-25:	0x24842801
Mig-27:	0x24841801
Mig-29:	0x24842821
Mig-31:	0x24841821

*** CHAFF ***

Chaff:	0x4100400

*** FLARES ***

MJU-7:	0x8100407
MJU-10:	0x810040a

*** SAMS ***

SA-01:	0x48580881
SA-02:	0x48580882
SA-03:	0x48580883
SA-04:	0x48580884
SA-05:	0x48580885

APPENDIX A

Guise Definitions

*** SAMS Continued ***

SA-06:	0x48580886
SA-07:	0x48580887
SA-08:	0x48580888
SA-09:	0x48580889
SA-10:	0x4858088a
SA-11:	0x4858088b
SA-12:	0x4858088c
SA-13:	0x4858088d
SA-14:	0x4858088e
SA-15:	0x4858088f

*** AAA ***

ZSU23_4M:	0x28842821

*** MISSILES ***

Sidewinder:	0x44140420
Tomahawk:	0x448b0420
Patriot:	0x443b0420
AIM_9L:	0x44140421
AIM_9M:	0x44140422
AIM_9P:	0x44140423
AIM_9J:	0x44140424
AIM_9D:	0x44140425
AIM_9G:	0x44140426
AIM_9H:	0x44140427
AIM_7M:	0x44140480
AIM_7L:	0x44140481
AIM_7F:	0x44140482
AIM_7E:	0x44140483

*** BOMBS ***

Mk82:	0x4c510420
GBU-10/12:	0x4c510441